- REMARKS -

Claim 1 has been amended to include the limitations of claim 10. No new subject matter has been added as a result of this amendment. Claim 1 has also been amended to remove a statement that appeared twice in the claim.

The Applicant thanks the examiner for having allowed claims 6 and 7. Claim 6 has been amended such that it is now in independent format. No new subject matter has been added as a result of this amendment. In addition, claims 8 to 9 have been duplicated from the original set of claims and are now dependent on the new independent claim 6 as claims 15 and 16. No new subject matter has been added.

Claim 17 is a new claim dependent on claim 1 and is fully supported by the specification as originally filed. Support for claim 17 can be found in figures 1 to 3, where it can be seen that the gas flow transducer is comprised in blocks 2, 3, and 4 of the figure. The plurality of gas flow passages are connected to the upstream and downstream side of the gas flow receiver 1 via two plastic hoses 6. The diaphragm 7 is shown in figure 3. No new subject matter has been added.

Claim 1, as amended, is directed to a flow transducer apparatus with immunity to vibration or acceleration, the apparatus comprising: a plurality of gas flow thermoanemometer-type transducer elements each sensitive to vibration or acceleration in at least one direction and generating an output signal proportional to gas flow and to a perturbation component resulting from the vibration or acceleration; a plurality of gas flow passages with constant cross-section leading gas flow from an inlet to an outlet through at least one of the elements, wherein the gas flow is always in a single, well-defined direction at one time; the elements being arranged on the common support and connected to the passages such that at least one of the perturbation component and the gas flow is measured differently by the elements; and circuitry receiving the output signal of each of the elements and outputting a vibration or acceleration immune output signal corresponding to the gas flow with the perturbation component substantially cancelled.

Claim 1 is now claim 10 as originally presented. The scope of claim 1 has not been shifted as a result of this amendment, but merely limited to gas flow transducers having thermoanemometer-type transducers. This is fully supported by the original disclosure, as is evidenced by page 7, lines 22 to 27, which states "To improve immunity to vibrations of the thermoanemometer-type differential pressure transducer, two or more thermoanemometer-type flow-sensitive elements are connected and used such that the parasitic acceleration-induced components of the signals can be separated from the flow-induced components, and cancelled, thus allowing identification of the flow-induced signals.". Therefore, it can be understood that the application of the claimed device is to improve immunity of the flowmeter to vibrations or shocks of the device and its parts, including the thermoanemometer-type differential pressure and flow transducers.

While it may be obvious that a sensor, whose sensing mechanism is based on moving mechanical parts, might also be sensitive to spurious externally-generated vibrations or acceleration, it is far from obvious that a device with no moving parts, such as a thermoanemometer-type transducer, would be sensitive to such spurious externally-generated mechanical disturbances. The sensitivity is caused by pockets of warm air that drift in the passages of the flowmeter as a result of the heat produced by the thermoanemometer. Disturbances caused by these pockets have a negative effect on the overall functioning of the device and therefore must be corrected for. Claim 1, as amended herein, proposes a solution to the presence of spurious mechanical disturbances by separating the flow-induced components from the acceleration-induced components in order to eliminate the acceleration-induced components from the final measurement.

The references cited and relied upon by the Examiner are related to flowmeters used for measuring the flow rate of gases and fluids. However, they use mechanical moving parts inside the flow tube to sense the flow and generate signals that can be used to measure the flow therethrough. None of these references teach having a device which uses thermoanemometer-type transducers which are immune to vibration or acceleration.

The Examiner has rejected claims 1-5 and 8-10 under 35 U.S.C. 103(a) as being unpatentable over Lew (US patent 5,186,056) in view of Kizawa (US patent 5,979,247).

Lew describes a vortex flowmeter with dual vortex sensors disposed downstream of and parallel to a vortex generating bluff body. Two movable flaps are arranged on opposite sides of the flow passage. Movement of these flaps causes two fluctuating electric signals to be generated and these signals are combined in such a way that the noise generated by the mechanical vibration of the flowmeter body is cancelled and an alternating output electrical signal representing the vortices is obtained.

Kizawa describes a flow sensor used for measuring the flow rate of a gas. The flow sensor comprises a flow tube for allowing a gas to be circulated therethrough. A resistance is arranged so as to go across the inside of the flow tube, and pressure ports are arranged on a tubular wall of the flow tube. The resistance includes a fixed resistance, which is a block fixed to a circumferential wall of the flow tube and closing part of a flow path of the flow tube, and a variable resistance, which is an orifice having a flap, the flap forming an aperture in the middle of the orifice while being displaced in the direction of flow of the gas.

In both Lew and Kizawa, mechanical moving parts are used to generate signals used to measure flow-related phenomena in a flow tube. Lew uses vortex sensing planar members and Kizawa uses a flap positioned in an orifice, the flap being displaced in the direction of gas flow. Neither one uses thermoanemometer-type transducers to generate an output signal proportional to gas flow. Furthermore, neither one uses thermoanemometer-type transducers to generate an output signal proportional to gas flow and to a vibration-induced perturbation component. Therefore, claim 1, as amended, is not suggested or taught by the cited references.

The Examiner has rejected claim 10 as being unpatentable over Lew in view of Kizawa and further in view of Bump et al. (US patent 5,975,126). The limitations of claim 10 have been moved into claim 1. However, the Applicant respectfully submits

that the combination of Lew, Kizawa, and Bump et al. does not teach or suggest claim 1 as amended.

Bump et al. describe a method and apparatus for detecting and controlling mass flow. The apparatus described comprises a fluid inlet, a fluid outlet, a fluid flow sensor which provides a raw output signal corresponding to an unknown mass flow rate, and a processor. A heater is located on the midpoint of the sensor tube. The heater transfers heat to the fluid present in the sensor tube. Upstream and downstream temperature sensing elements are located on either side of the heater, equidistant from the heater. The temperature sensing elements detect the amount of heat contained in the fluid. The temperature difference between the upstream temperature sensor and the downstream temperature sensor is proportional to the mass flow of the fluid.

Although Bump et al. does teach the use of temperature sensors to perform flow measurements, it would not have been obvious to combine the temperature sensors of Bump et al. with Lew and Kizawa in order to obtain the apparatus claimed in claim 1 of the present application. The claim is for a flow transducer apparatus with immunity to vibration or acceleration. As stated above, it would not have been obvious to know that placing temperature sensing elements would result in a vulnerability to vibration or acceleration, since no mechanical moving parts are present in the flow tube. Therefore, it would not have been obvious to separate the perturbation component from the gas flow component such that the perturbation component can be cancelled from the final signal.

Therefore, none of the cited references teach or suggest "said elements being arranged on said common support and connected to said passages such that at least one of said perturbation component and said gas flow is measured differently by said elements" [emphasis added]. Therefore, the subject matter of claim 1 is new and inventive over the cited references.

Claims 2 to 5 and 8 to 9 are dependent on claim 1, which is believed to be patentable.

In view of the foregoing, it is believed that the present application is in good order for allowance, and early consideration to that end is accordingly courteously solicited.

Respectfully submitted,
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